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EVALUATION OF SOUTHERN PINE BEETLE INFESTATIONS IN THE SANDY CREEK AREA, HOMOCHITTO NATIONAL FOREST, MISSISSIPPI

by

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INTRODUCTION

On October 25 and 26, 1979, a biological evaluation was conducted within the Sandy Creek Rare II Further Planning Area on the Homochitto National Forest. The area is 2500 acres of mixed hardwood pine forest. The area is approximately 50 percent pine and 50 percent hardwood; loblolly pine (Pinus taeda L.) being the predominant pine species. The evaluation, including aerial survey and on-site examination, was conducted by personnel of Forest Insect and Disease Management, State and Private Forestry, U.S. Forest Service. The purpose of the evaluation was to determine the current status of the southern pine beetle (Dendroctonus frontalis Zimm.) population within the designated area.

TECHNICAL INFORMATION

Host Trees Attacked - The southern pine beetle attacks all species of southern yellow pine. On this forest, however, loblolly pine, Pinus taeda L., is the preferred host.

Type of Damage - Damage caused by the southern pine beetle is tree mortality resulting from adult beetles constructing egg galleries in the cambial region of the host trees. Blue-staining fungi (Ceratocystis spp.), introduced by the beetles and secondary insects, accelerate the kill by blocking the vascular system of the tree.

Life Cycle of the Insect - The beetles attack and construct winding egg galleries in the cambium. Eggs are deposited along the galleries. White larvae hatch from the eggs and further mine the cambium and then construct pupal cells in the outer bark. After transforming to adults, the beetles emerge. During the warmer months, the life cycle is completed in about 30 days. There may be as many as seven generations each year.

METHODS

Aerial Survey and Ground Checks

Southern pine beetle spots were observed from the air and ground checked to determine the number of trees affected and to predict future tree

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mortality expected to result from the southern pine beetle's activity. Numbers of vacated and infested trees, basal area, age, average height, average diameter breast height, and radial growth measurements were recorded during the ground check. Bark samples (3.1 dm^2) were collected for attack:emergence analysis employing Moore's (1977) method.

Attack:Emergence Evaluation

The attack:emergence analysis procedure for estimating subsequent tree mortality from SPB infestations was used as a predictive tool (Moore 1977). This procedure allows prediction of future spot growth based on the ratio of southern pine beetles entering the trees to the number of beetles emerging (this is both attacking adults and developed brood). To predict an increase in the SPB population, an attack:emergence ratio of 1:10 or greater is needed. Attack:emergence ratios for spots predicted to remain static in growth would be 1:5 - 1:9.9. A decreasing population would have an attack:emergence less than or equal to 1:4.9. This procedure has been proven on a spot basis for a 2-year period in North Carolina (Moore 1977).

RESULTS

Ground Checks

A total of three southern pine beetle spots were present in the Sandy Creek Area. In all, 1,620 trees had been affected by southern pine beetle. Ground check data is summarized in table 1.

Attack:Emergence Evaluation

The average attack:emergence ratio for the Sandy Creek Area, A:E = 1:14.2, indicates an increasing SPB population. Based on attack:emergence procedure, FY 80 losses should be from 1.0 - 2.0 times the loss experienced in FY 79.

Basal areas ranged from 125 - 190 ft^2/ac. Basal areas greater than 120 ft^2/ac have been shown to be high-hazard areas for southern pine beetle. The red:green tree ratio averaged 1:4.5. This means there were approximately 4.5 green infested trees for every red infested tree.

Due to 1) a large A:E ratio, 2) high basal areas, and 3) the large red:green tree ratio, an increasing condition of 1.5 was considered the best prediction of FY 80 losses. Thus, the number of trees killed during FY 80 should be 1.5 times (2,430 trees) the FY 79 mortality.

Hazard Rating[2/]

Hazard rating techniques take into consideration site and stand characteristics and southern pine beetle preferences to determine the probability of a particular area having southern pine beetle mortality.

2/ This methodology is being used on a trial basis. Further analysis and evaluation must be made before further use.

Table 1. Summary of ground check and attack:emergence bark analysis data for Sandy Creek Area, Homochitto National Forest, Mississippi, October 1979

Spot No.	Total No. Trees	No. Infested Trees			No. Vacated Trees	Red:Green Ratio[a]	Attack: Emergence	Age	BA	Avg. Ht.	Avg. dbh
		Total	Green	Reds & Faders							
1	865	313	248	65	552	1:3.8	1:14.8	45	125	80'	19"
2	358	121	101	20	237	1:5.1	1:13.5	43	155	79'	18"
3	397	88	45	43	0[b]	[c]	[d]	45	190	116'	19"
						$\bar{x}$ = 1:4.5	$\bar{x}$ = 1:14.2				

[a] Based on numbers of infested red and faders compared to numbers of green infested trees. Average R:G = 1:4.5; that is, an average of 4.5 green trees is present for each infested red and fading tree in the spots.

[b] Salvage operations removed 309 trees from this spot.

[c] No red:green tree ratio was calculated since red infested trees could have been removed during salvage, thus affecting the ratio.

[d] No vacated trees were present for collection of attack:emergence samples.

We rated each stand for the likelihood of continued southern pine beetle using two different methods. The results are as follows:

	Spot 1	Spot 2	Spot 3
TFS[3]	High	High	High
USFS[4]	High	High	High

DISCUSSION

Alternatives

At this time, there are no preventive measures available to insure against future southern pine beetle attacks. However, there are several alternatives available which will reduce the number of trees killed by southern pine beetles. Following are five alternative courses of action. Each has its limitations and these are discussed.

Alternative 1. Remove trees through salvage.

Salvage is the method most often used for stopping the growth of existing spots. This strategy involves removing a buffer strip of noninfested trees, all green infested and red infested trees, and the trees already killed by the beetles. To implement this, all trees within 80 ft of a green infested tree should be cut. This is the buffer strip and should be cut first. All infested trees should be cut next. Vacated trees are cut only for utilization purposes. All trees should be felled toward the center of the spot. The reason for this is to keep infested trees as far away from noninfested trees as possible. This reduces the chance of beetles killing additional trees. If this action is to be implemented, it should be done as soon as possible.

The limitations of this procedure are: 1) other trees may be mechanically damaged during the salvage operation, 2) the soil will be disturbed, 3) the removal of infested pines will slow down progress towards the last phase of forest succession which is a climax hardwood forest (conversely, the beetles are speeding it up).

Alternative 2. Salvage only infested and buffer trees.

This is similar to Alternative 1, except only the buffer strip and currently infested trees would be removed. All uninfested trees would be left standing. This would favor parasites and predators (including woodpeckers).

The limitations would be the same as Alternative 1. However, since fewer trees will be removed, there will be less logging impact to the site and less chance of damaging the residual stand.

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[3] Texas Forest Service. Guide to setting control priorities on individual southern pine beetle spots. Texas Forest Service. Unpubl.

[4] Smith, J. D. Implementing hazard ratings on Kisatchie National Forest. USFS, S&PF, Pineville, La. Unpubl.

Alternative 3. Cut-and-leave infested trees.

This is accomplished by felling a buffer strip and all infested trees toward the center of the spot. The purpose is to stop spot growth. Use of this method causes beetles to disperse at a time of year when this behavior is unnatural. This results in a reduction of mass attacked trees and spot growth ceases.

The limitations with this control practice are 1) it can only be used in the summer (May 1 - September 30) since these are the only months beetles are not dispersing, 2) it should only be used on small spots, normally 50 infested trees or less (all three spots we observed were too large to use this method, table 1), and 3) this method has proven effective in Texas, but is still being evaluated in other areas, including Mississippi.

Alternative 4. Chemically treat infested trees.

In this method, infested trees are felled toward the center of the spot, cut into workable lengths, and sprayed with lindane or Dursban® 4E. The purpose of this method is to kill the beetle population.

Limitations to this method are: 1) to be effective, all bark surfaces must be sprayed (this involves turning the logs which will be difficult due to the size of the trees involved), and 2) the adverse effect of the insecticide on nontarget organisms in the sprayed trees.

Forest Insect and Disease Management, Pineville, La., should be contacted prior to the extensive use of chemical control for an update on latest restrictions or application procedures.

Alternative 5. Do nothing and allow the infestation to follow a natural trend.

The entire Sandy Creek Area appeared to be of uniform age and species composition. The trees were approximately 45 years old and the area was about 50 percent hardwood and 50 percent pine. Based on attack:emergence data, basal areas, and hazard ratings (see Results section), substantial losses can be expected in this area again next year. Based on our predictions, in excess of 2,430 pine trees will be lost.

RECOMMENDATION

The resource management objective of this area is to maintain the present wilderness characteristics of the area. We feel this is best accomplished by controlling growth of the spots. Therefore, due to the losses expected next year, Forest Insect and Disease Management recommends the use of Alternative 2 to control spot growth in the area. This will control spot growth with the minimum amount of impact to the area. To be most effective, salvage should be completed by November 30, 1979.

If any of Alternatives 1 - 4 are selected, it would be advisable to have Forest Insect and Disease Management Personnel assist in spot treatment.

These three southern pine beetle spots will be checked next April for effectiveness of treatment by Forest Insect and Disease Management. It is recommended any additional infested trees in these three spots be removed or treated at this time.

If new spots develop, it would be advisable to conduct another biological evaluation.

For further information, contact Forest Insect and Disease Management, Pineville Field Office, Pineville, La. 71460, (Phone FTS 497-3311, or Commercial 318-445-6511, Ext. 311).

REFERENCE

Moore, G. E.
1977. Factors for determining trends in southern pine beetle spots. J. Environ. Entomol. Vol. 7, No. 3, pp. 335-341.